PACIFIC SALMON COMMISSION
JOINT CHUM TECHNICAL COMMITTEE
2008 POST SEASON SUMMARY REPORT

TCCHUM (10)–2

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MEMBERSHIP OF THE JOINT CHUM TECHNICAL COMMITTEE, 2008

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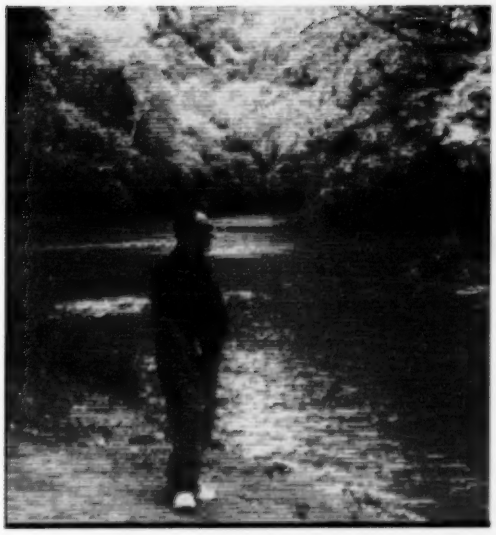

Nick Lampsakis, United States co-chair of the Chum Technical Committee, passed away suddenly and unexpectedly on July 14, 2009. Nick had been a member of the committee since 1986 and co-chair since 2006. The many chum technical committee members he worked with on both sides of the border over the years benefitted from his extensive knowledge of and passion for salmon management and appreciated his zest for life. Nick's work supported much of the progress the chum committee made over its first quarter century. Nick's opinions were strongly held, not easily changed – and usually proved to be correct. The chum committee, and the entire Pacific Salmon Commission family, will miss Nick's expertise, dedication, and companionship.

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1. INTRODUCTION

This Pacific Salmon Commission (PSC) Joint Chum Technical Committee report presents the information on chum salmon stocks and fisheries in southern British Columbia and Washington for the year 2008 to address the specific provisions and requirements of the 2008 version of Chapter 6, Annex IV of the Pacific Salmon Treaty (PST) (Appendix 1).

The treaty between the governments of Canada and the United States of America (U.S.) concerning Pacific salmon was designed to facilitate co-operation between the two countries in the management, research and enhancement of Pacific salmon stocks. Chapter 6 of Annex IV (Chum Annex) of the PST required that certain fisheries for chum salmon in southern British Columbia (B.C.) and Washington be managed in a specified manner. In each country other fisheries, while not specifically mentioned in the PST, are known to harvest chum salmon originating in the other country. This report presents various aspects of the chum salmonfound in Washington State and in B.C. waters between Vancouver Island and the mainland and off the west coast of Vancouver Island, and discusses the management actions of Canada and the U.S. in relation to the PST requirements.

2. STATUS OF TREATY REQUIREMENTS

Chum salmon stocks and fisheries in southern British Columbia and in United States Areas 4B, 5, 6C, 7, and 7A (Appendix 2) were managed under the terms set out in the 2006 Chum Agreement (Appendix 1). The following provides a brief synopsis of the Canadian and U.S. management actions taken to meet its provisions in 2008.

2.1 Paragraph 1:

The Parties were to maintain a Joint Chum Technical Committee (Committee) to review stock status, develop new methods for stock management and report on management and research findings.

After the 2008 fishing season the Committee convened twice in 2008, during the PSC post-season meeting and for additional work in Washington State later in the year. The Committee completed the 2006 annual post season report and worked on development of criteria for endowment fund projects pertinent to chum salmon. The Committee also provided technical support to the Southern Panel in its efforts to re-negotiate the Chum Annex which was scheduled to expire at the end of 2008.

2.2 Paragraph 2:

The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.

The Committee used agreed-upon methods to assess catch composition estimates for 2008 fisheries, using historical estimates of stock contribution. These historical estimates may no longer be representative of the current chum salmon catch composition in Southern B.C.

fisheries. The Committee is currently evaluating new methods of assessing chum salmon catch composition.

2.3 Paragraph 3:

Canada and the United States assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).

Tables 3 and 11 provide the harvest of chum salmon during the period of summer chum salmon migration in boundary areas. Due to the low numbers of chum salmon encountered during this time period, neither party collected any samples for genetic stock identification (GSI).

2.4 Paragraph 4:

During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: Purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.

Regulations were implemented by both countries to require the live release of chum salmon in these areas during this time period.

2.5 Paragraph 5:

In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

Table 1 provides an evaluation of the performance of the Clockwork (1997–2001) and the current Johnstone Strait management strategy (2002–2008). Historical GSI results and genetic estimates from 2006 and 2007 indicated a continued low contribution of U.S. stocks in Johnstone Strait, Strait of Georgia and Fraser River chum salmon fisheries.

Information regarding the contribution of depressed natural spawning chum salmon to the catch was not obtained. Current levels of genetic resolution cannot distinguish individual populations.

Fishery descriptions (see section 3.4) indicated that terminal areas fisheries were generally managed to minimize the interception of non-targeted stocks.

2.6 Paragraph 6:

In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:

a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter

as critical. By the end of 2008, Canada will determine a revised critical threshold.

b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.

c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.

While no specific estimates of inside chum salmon abundance were available, Canada indicated during the season, on the basis inside area fisheries, that the inside area run size was not at critical level. The U.S. was notified by Canada of the abundance status. Canada planned and managed its Johnstone Strait fishery for a maximum total exploitation rate of 20% (Table 1).

2.7 Paragraph 7:

In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:

a) For Fraser River terminal area run sizes, identified inseason, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.

b) For Fraser River terminal area run sizes, identified inseason at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.

In 2008, inseason estimates indicated a terminal return higher than the specified Fraser River gross escapement threshold. Fisheries proceeded as per the Fraser River management rules (section 3.3.2).

2.8 Paragraph 8:

Canada will manage the Nitinat gillnet and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.

In 2008, Canada addressed specific bycatch concerns by delayed opening dates (to early October), the use of reduced fishing areas, the use of weed lines, and species selective fishing techniques.

2.9 Paragraph 9:

For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 season may reach levels similar

to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).

Chum salmon catch levels in the 2008 West Coast Vancouver Island troll fishery were significantly below the 1985 and 1986 levels. Therefore, no GSI sampling occurred.

2.10 Paragraph 10:

In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:

a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.

b) For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.

c) For run sizes below the critical threshold, the U.S. catch of chum salmon in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.

d) The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives

e) U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.

f) The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.

In 2008, U.S. fisheries in Areas 7 and 7A were conducted in accordance with the above provisions (see section 5.3.1 and 5.3.2).

2.11 Paragraph 11:

In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:

a) It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical

year in which a portion of the assigned difference is not taken, that portion shall be foregone.

b) When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.

c) When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.

d) It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.

e) Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.

f) When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.

The 2007 Annex specified a default total annual catch ceiling which was the sum of a base catch ceiling of 130,000, plus an amortized historical accumulated difference of 46,000 plus an amount of up to 15,000 if the previous year's base catch was not met. It also specified that the amortized historical accumulated difference and the 15,000 carryover, if not taken, would be foregone. For 2008, the U.S. catch ceiling for Areas 7 and 7A was 191,000.

In 2008, the U.S. commercial fisheries in Area 7 and 7A commenced on October 11th and continued remained open through November 15th (Table 12 and 13). These fisheries were managed to avoid the capture of non-targeted species. These fisheries did not need further modification based on the status of the Fraser River abundance.

2.12 Paragraph 12:

In the years 2006 through 2008, the United States shall conduct its chum salmon fishery in the Strait of Juan de Fuca (United States Areas 4B, 5, and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.

This fishery has continued to be restricted to gillnet gear only and to treaty Indian fishers from four tribes. The technical committee has not specifically addressed interception estimates during the 1994 through 2008 time period. GSI samples collected from this fishery in prior years indicate the majority of the catch is chum salmon of U.S. origin, and the total catch and effort in this fishery has declined significantly in recent years (see Table 10). Therefore, interceptions have likely decreased as well.

2.13 Paragraph 13:

All information concerning bycatch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.

Bycatch species were reported in the annual post season reports of the Parties.

3. SOUTHERN BRITISH COLUMBIA CHUM SALMON

3.1 Introduction

Southern B.C. chum salmon stocks and fishing areas (Appendix 2) are, for the purposes of management, analysis and reporting, divided into four major components. The three components of Johnstone Strait, the Strait of Georgia and the Fraser River are described as inside chum salmon. The fourth component is West Coast Vancouver Island.

3.2 Status of Treaty Requirements

During 2008 the fisheries were managed according to the requirements of Annex IV, Chapter 6, as amended in 2006 (Appendix 1).

3.3 Conservation and Harvest Management Requirements

The general management approach adopted by Fisheries and Oceans Canada (CDFO) is to achieve wild escapement targets, while augmenting production through enhancement of selected stocks. In practice, this approach is achieved through the application, in mixed stock fishery areas, of harvest rates which are compatible with wild or natural stock productivity. If there are stocks which return to their area of origin in numbers above that area's escapement goal, they may be subjected to additional harvesting within their terminal areas.

The following describes the harvest strategies and fishing plans for Southern B. C. chum salmon stocks in relation to these above requirements.

3.3.1 Johnstone Strait Chum Salmon Management Strategy

The Clockwork strategy in use from 1983 to 2001 was described in the Final 1985 Post Season Summary Report of the Joint Chum Technical Committee (TCCHUM 87-4). The Clockwork strategy was designed to rebuild wild chum salmon stocks to the estimated optimum escapement levels by limiting the overall harvest rate. Ryall *et al.* 1999 (Canadian Stock Assessment Secretariat Research Document 99/169), provided an assessment of the effectiveness of the Clockwork strategy. The Clockwork management strategy required accurate estimates of catch and escapement and the reliability of this strategy depended upon the quality of these data. During the time period in which inside chum salmon stocks were managed by the Clockwork

strategy, the high variability in chum salmon returns, the inadequate escapement coverage, and highly unstable fishing opportunities demonstrated a need to move to an alternative approach.

Following extensive technical reviews and several years of discussions with First Nations, stakeholders and the commercial fishing industry, the stepped exploitation rate approach ("Clockwork"(described in TCCHUM 87-4)) was replaced by a stable fishing schedule designed to approximate a fixed exploitation rate (~20%). Some of the key objectives of this strategy are to ensure sufficient escapement levels while providing more stable fishing opportunities. The exploitation rate is set at 20% across all harvesters, when abundance is above critical level. Of this 20%, 15% is allocated to the commercial sector, and the remaining five percent is set aside to satisfy Food/Social/Ceremonial (FSC), recreational, test fish requirements and to provide a buffer to the commercial exploitation. Tagging studies conducted in 2000, 2001 and 2002 helped in the development of this strategy by assessing the migration timing and harvest rate on an available abundance of chum salmon in the Johnstone Strait. The impact of the Johnstone Strait fisheries, Clockwork years (1998–2001) and new approach (2002–2008), on inside chum salmon stocks are detailed in Table 1.

For 2008, the specific objectives of the fixed exploitation strategy were to:

a. Continue to rebuild/maintain stocks to the optimum wild escapement objective (defined as 2.5 million wild inside chum salmon);
b. Establish a preseason fishing plan to achieve an exploitation rate of 20% on inside chum salmon;
c. Stabilize commercial catch to provide opportunities at both low and high abundance levels.

3.3.2 Strait of Georgia Chum Salmon Management Strategy

Chum salmon stocks returning to terminal areas within the Strait of Georgia are directly affected by the harvest in Johnstone Strait. Chum salmon returning to mid Vancouver Island (Area 14) are primarily from enhancement facilities. Terminal harvesting is directed at a mix of surplus mid Vancouver Island wild and enhanced chum salmon, with the conservation requirements of passing chum salmon stocks considered. Conservation requirements of local Chinook and coho salmon in this fishery area are also considered in determination of area and time closures for the Area 14 chum salmon fishery.

Other areas in the Strait of Georgia where terminal surpluses may be available are Jervis Inlet (Area 16), Nanaimo (Area 17), Cowichan (Area 18) and Saanich Inlet (Area 19). Terminal surpluses in these areas are estimated from escapement and test and commercial harvesting when available.

Table 1. Assessment of Clockwork and the current Johnstone Strait Chum Salmon Management 1999–2008.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
PRE-SEASON										
Forecast	Below Average	Below Average	Below Average	Average to Above Average	Below Average	Average	Average to Above Average	Average to Above Average	Average to Above Average	Below Average
POST-SEASON										
Inside Area Abundance[1]	3,859,027	1,243,128	4,881,017	5,116,605	3,546,995	5,453,179	3,086,000	4,157,070	2,462,848	2,136,060
Inside Area Catch	447,590	270,805	768,113	1,628,932	1,334,373	1,839,017	1,282,324	1,548,671	802,916	582,015
Estimated Harvest rate	116%	21.8%	15.7%	31.8%	37.6%	33.7%	41.6%	37.3%	32.6%	27.3%
Johnstone Strait (JS) Catch										
Commercial Areas 11-13[2]	38,002	176,980	209,914	668,936	924,505	1,176,611	856,029	859,201	480,620	299,775
First Nations Areas 11-13	20598	13,621	23,562	17,131	14,780	27,041	16,841	16,2453	14,859	11,630
Johnstone Total	58,600	190,601	233,476	686,067	939,285	1,203,652	872,870	875,403	495,479	311,405
Target Harvest Rate[3]	*20%*	*10%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*	*20%*
Estimated Harvest Rate	1.5%	15.3%	4.8%	13.4%	26.5%	22.1%	28.3%	21.1%	20.1%	14.6%
ESCAPEMENT (includes wild and enhanced)[4]	3,411,437	972,323	4,112,904	3,487,673	2,212,622	3,614,162	1,803,676	2,608,399	1,659,932	1,554,045

(1) Total Inside Area stock includes total Inside Area catch plus escapement. Total Inside Area catch includes all Inside Area catches (Inside Area catch composition based on historic GSI for all fisheries).
(2) Includes commercial, sport and test fishery catches
(3) Desired harvest rate pre 2002 based on Clockwork management strategy. Desired harvest rates post-2001 are based on 20% fixed harvest rate approach.
(4) Escapement numbers do not include any removals associated with hatchery rack. Those values are included in catch.

3.3.3 Fraser River Chum Salmon Management Strategy

The harvest management plan for Fraser River chum salmon outlines management goals and allocation objectives for chum salmon fisheries occurring within the Fraser River. Fisheries are structured to ensure a spawning escapement goal of 800,000, using in-season information on returning chum salmon abundance. Decision rules that guide the management of Fraser River chum salmon fisheries are summarized in Table 2.

Management of chum salmon fisheries occurring within the Fraser River is guided by the need to minimize impacts on co-migrating stocks of concern, including Interior Fraser coho salmon and Upper Fraser steelhead. In order to limit incidental impacts on Interior Fraser coho salmon, fishing for all sectors (First Nations, recreational, and commercial) is restricted from early September to mid October within the Fraser River mainstem below Sawmill Creek. Conservation measures taken to protect Interior Fraser steelhead are developed in conjunction with the B.C. Ministry of Environment on an annual basis, and are primarily focused on reducing the impact of Fraser River commercial gillnet fisheries. In recent years, these restrictions have resulted in the delay of commercial fishing opportunities for chum salmon until late October, with the exception of those fisheries that operate with selective gear.

Table 2. Key decision points for Fraser River chum salmon.

Run Size	Harvest Plan	First Nations	Commercial	Recreational
<800,000 in Fraser	<10%	Limited (Reduced hours and days / week fishing)	Closed	Restricted openings
800,000–916,000 in Fraser	Catch not to exceed 81,000 (72,000 First Nations and 9,000 test fishing)	Normal (72,000)	Closed	Tributary openings
916,000–1,050,000 in Fraser	Commercial catch not to exceed 10% for chum salmon.	Normal (72,000)	Open (35,000–105,000)	Open
>1,050,000 in Fraser	Commercial catch not to exceed 15% for chum salmon.	Normal (72,000)	Open	Open

3.3.3.1 Fraser River Inseason Run Size Estimation

The Albion test fishery has operated every year on the Fraser River since 1979, providing the catch data used to estimate the abundance of chum salmon returning to the river. Chum salmon returns are estimated using a Bayesian model that incorporates pre-season information on run size and migration timing, with in-season information on chum salmon catch from the Albion test fishery, to estimate the abundance of returning Fraser River chum salmon (Gazey and Palermo 2000). The Albion chum salmon test fishery normally operates from September 1st through November 30th.

The first in-season estimate of Fraser River chum salmon returns is typically provided on or about October 15th. Limited FSC fisheries for Fraser chum salmon may be permitted prior to this date, unless a conservation concern has been identified.

3.3.4 West Coast Vancouver Island Chum Salmon Management Strategy

Chum salmon stocks return to all statistical areas on the west coast of Vancouver Island (WCVI). The most significant WCVI group of stocks is the Nitinat group (Area 22) which includes a major hatchery on the Nitinat River. The net spawning escapement requirement for the Nitinat system totals 175,000, including 150,000 into the Nitinat River and 25,000 into other tributaries. Additional requirements for hatchery and test fishing may total up to 75,000. Therefore, the gross escapement requirement is 250,000 chum salmon.

The management of this fishery is based on achieving the gross escapement requirement of 250,000 into the Nitinat watershed. Escapement targets are set to ensure that all timing components of the run are represented. Weekly fisheries are generally scheduled in Area 21 and surrounding waters to harvest any identified surplus.

The fishing plan was based on providing early opportunities for gillnet and limited effort seine fishing, followed later in the season by the tradition full fleet seine fishery (and gillnet) depending on catch allocation. All fisheries are dependent on reaching weekly escapement milestone levels into Nitinat Lake. Early season opportunities are constrained by concerns over Thompson River steelhead bycatch. A gillnet test vessel, along with visual surveys of the river, is used to determine escapement into Nitinat Lake.

Since 1995, bycatch concerns at Nitinat have been addressed by delayed opening dates, reduced fishing area, increased use of weed lines, and species selective fishing techniques. In 1998, to minimize encounters of passing stocks of coho salmon and Interior Fraser River steelhead, the first commercial gillnet fishery was delayed until the beginning of October. In addition, the initial fishing area was reduced to within a one-mile boundary between lines true south from Pachena and Dare Points, based on information from the gillnet test fishery. To reduce mortality of coho salmon and steelhead and to improve the quality of catch data, the following measures were implemented for the entire season:

- non-retention of coho salmon and steelhead (seine and gillnet)
- mandatory functional revival tanks (seine and gillnet)
- daylight fishing only (gillnet)
- onboard observers (portions of seine and gillnet fleet)
- logbooks and weekly hail-ins (seine and gillnet)
- two-meter weed line for gillnets

In 2008, all measures continued to be implemented with the exception of on-board observers.

With the exception of near-terminal areas, such as Nitinat or Tlupana Inlet, where hatchery stocks dominate, WCVI chum salmon fisheries are managed to approximately a 20% exploitation rate. The exploitation rate is controlled by fishing migration areas and limiting effort to one or two days per week, depending on the number of vessels participating in the

fishery. Both commercial gillnet and seine fleets target WCVI chum salmon. Seine opportunities generally occur when surplus to escapement/brood requirements are identified (Nitinat and Tlupana).

First Nations fisheries remain a priority and occur in terminal areas. ESSR fisheries have also occurred at Nitinat Lake targeting hatchery surplus production.

3.4 Annual Fishery Descriptions

Fisheries targeting chum salmon in Johnstone Strait, Strait of Georgia and the Fraser River generally begin in late September and end in November. These fisheries are directed at fall chum salmon. In addition to these directed fisheries, a bycatch of chum salmon may occur in fisheries directed at sockeye and pink salmon. This chum salmon bycatch is assumed to be comprised mainly of summer chum salmon. The summer chum salmon catches in boundary area fisheries are presented in Table 3.

Table 3. Catch of summer chum salmon by statistical area for commercial, research and test fishing vessels[1] (July through the second week of September) 1999–2008.

Year	Statistical Weeks	Statistical Area					
		18	19	20	21	29[2]	Total
1999	7/1–9/2	0	0	35	0	49	84
2000	7/1–9/2	0	0	37	0	72	109
2001	7/1–9/2	0	0	26	0	77	103
2002	7/1–9/2	0	0	37	0	197	234
2003	7/1–9/2	0	0	27	0	54	81
2004	7/1–9/2	0	0	17	0	686	703
2005	7/1–9/2	0	0	0	0	115	115
2006	7/1–9/2	0	0	52	0	419	471
2007	7/1–9/2	0	0	0	0	49	49
2008	7/1–9/2	0	0	0	0	67	67
Area Total		0	0	231	0	1,785	2016

[1] Catches do not include PSC test fisheries
[2] Majority of this catch is fresh water based

The following sections describe the fisheries directed at chum salmon in each of the Southern B.C. areas in 2008.

Preseason expectations for 2008 indicated a below average return for Southern B. C. chum salmon stocks based the anticipation of poor survivals of the dominant 4 year old age class from the 2005 outmigration year, (evident in both weak pink and coho salmon returns in 2006) and lower than average 3 year old composition of the return in 2007.

3.4.1 Johnstone Strait

In 2008, the test fishery, which consisted of two purse seine vessels fishing from late September until late October on a daily basis was pivotal in establishing run timing, relative abundance and stock structure information. This test fishery provided a relative indication of inside chum salmon abundance over the historic time series.

In 2008, Competitive seine and gillnet fisheries were conducted based on the preseason plan. Modifications to the purse seine and gillnet plans were made to account for variation in effort participation compared to the pre-season expectations. Table 4 outlines the duration of fishery openings during the 2008 season.

There were six competitive commercial chum salmon fisheries in Johnstone Strait in 2008 and one troll individual transferable quota (ITQ) fishery. The first competitive purse seine fishery occurred on October 1st (12 hours). The catch for this fishery was 59,000 chum salmon. The second competitive fishery occurred on October 6th–8th (gillnet 41 hours) and harvested a 23,000 chum salmon. The third fishery on October 13th–16th (gillnet 63 hours) harvested 39,000 chum salmon. The next fishery (gillnet 41 hours) on October 23rd–25th caught 27,000 chum salmon. The fifth fishery (seine 10 hours) on October 20th harvested 80,000 chum salmon. Due to lower than expected effort in the previous seine openings an additional opening was provided on October 21st (5 hours) with a harvest of 48,000 chum salmon. The effort based troll ITQ fishery occurred throughout the month of October with the total catch of 21,000 chum salmon.

The total 2008 commercial catch for Johnstone Strait (Areas 12 and 13) was 300,000 chum salmon. There were no directed chum salmon fisheries in terminal areas of Johnstone Strait. In addition, First Nation and recreational catches were estimated at 12,000 and 3,000 chum salmon respectively for the 2008 season.

Table 4. Johnstone Strait chum salmon commercial openings 2008 (hours open).

Year	Statistical Week	Statistical Area					
		12			13		
		Seine	Gillnet	Troll*	Seine	Gillnet	Troll*
2008	10-1	12			12		
	10-2		41			41	
	10-3		63			63	
	10-4	15	41		15	41	
2008 Total		27	145		27	145	

*Troll was open from Sept 29–Oct.11 and Oct. 14–Nov. 5. Fishery was an effort quota over that time period

3.4.2 Strait of Georgia

All Qualicum (Area 14) commercial fisheries occurred in the Puntledge River surrounding area. There were no openings in the Big and Little Qualicum river areas. The gillnet openings occurred on October 16th–18th, 20th–22nd, 29th–31st, November 5th–7th. The total gillnet catch was 13,700. The troll fishery opened on October 11th and closed on November 6th, however there was neither effort nor catch in this fishery. No seine fisheries were conducted.
No commercial fisheries occurred in Jervis Inlet (Area 16).

In Nanaimo (Area 17) one gillnet opening occurred for 24hrs on October 30th for a total catch of approximately 800 chum salmon.

In Cowichan (Area 18) there were 2 gillnet openings, one on November 15th and 16th for 24hrs and one from November 20th to 22nd for 48hrs. The total catch from these fisheries was approximately 3,600. A seine test fishery occurred between November 4th and November 19th for 6 days and caught and released 3,200 chum salmon. No commercial seine or troll openings occurred.

In Saanich Inlet (Area 19), there were no commercial fisheries conducted as there was no surplus identified. A seine test fishery occurred between November 4th and November 18th for 6 days and caught and released 4,700 chum salmon.

The total catch estimated by the creel survey for the Strait of Georgia (Areas 14 to 19, and 28, 29 (marine areas)) was approximately 50.

First Nation catch was approximately within the Strait of Georgia was approximately 11,200 chum salmon.

3.4.3 Fraser River

In 2008, the Area E commercial gillnet fishery (which operates in the lower Fraser River, below Mission) had one 12 hour opening on October 29th, which harvested 38,000 chum salmon.

The First Nations FSC fishery was open on weekends from October 4th until December 15th, and harvested 31,553 chum salmon.

The First Nations Economic Opportunity (EO) fishery opened for selective gear only (beach seines), from October 16th to October 21st in the mainstem Fraser River, and in the Harrison River from October 22nd to November 21st. The total number of chum salmon harvested in the EO fishery was 50,004 fish.

The last in-season Fraser River run size estimate (based on Albion test fishery data through November 25th) was 1.775 million.

3.4.4 West Coast Vancouver Island

The Nitinat commercial chum salmon fishery (Area 21) is the largest on the west coast and targets returning Nitinat River hatchery stocks. Catch in Nitinat has traditionally occurred by gillnet and seine outside the lake in marine areas. In the past, catch of non West Coast chum salmon has occurred in the outside seaward portion of the fishing area. Management actions have been implemented to reduce this catch by restricting harvest closer to the terminal area. More recently, First Nations' harvests occurred within the lake (Area 22). Total chum salmon return (catch and escapement) are shown in Table 5.

The pre-season Nitinat forecasts were based on escapement, survival of each year class and previous years' environmental factors. The pre-season forecast for 2008 return was 315,000 chum salmon.

Table 5. Nitinat area catch and escapement 1999–2008 (Areas 21 and 22).

Year	Area 21		Area 22	
	Seine Catch	Gillnet Catch	In-Lake Catch & Broodstock	Natural Spawners
1999	12,000	85,000	89,000	153,000
2000	2,000	7,000	11,000	22,000
2001	89,000	75,000	178,000	303,000
2002	466,000	81,000	383,000	40,000
2003	265,000	190,000	78,000	243,000
2004	72,000	156,000	166,000	250,000
2005	385,000	294,000	237,000	310,000
2006	224,000	230,000	145,000	135,000
2007	0	180,000	22,000	116,000
2008	19,000	25,000	30,000	50,000
Average	154,000	132,000	134,000	162,000

Gillnet fisheries occurred on September 30th – October 1st and on October 15th. The seine fishery commenced on October 5th but was closed for two days due to weather and resumed on October 8th for a total of two fishing days.

The Dididaht First Nation conducts FSC and ESSR fisheries in Nitinat Lake. Combined FSC and ESSR fishery catch in 2008 was 6,500 chum salmon.

Commercial chum salmon fisheries in Barkley Sound (Area 23), Clayquot Sound (Area 24) and Outer Nootka Sound / Tlupana and Esperanza Inlet (Areas 25) are managed to a specific number of vessel fishing days per week. This harvest rate approach is designed to maintain a harvest rate of approximately 20% or less on all stocks.

The commercial chum salmon assessment fishery in Barkley Sound (Area 23) targets returning wild stocks. Gillnet fishing occurred on 4 days, September 30th, October 7th, October 14th and 15th. The effort ranged from four to seven vessels. Coho salmon were allowed to be retained. One onboard observer was required in this fishery. The 2008 chum salmon catch estimate for gillnets in Area 23 was 2,100 chum salmon.

The 2008 Clayquot Sound (Area 24) chum salmon assessment fishery was designed to avoid Chinook interceptions. Gillnet fishing occurred on October 8th and October 15th. The fleet size was 3 vessels in each fishery. The chum salmon catch estimate for gillnets in Area 24 was 500 chum salmon.

There are 3 fishing areas in Area 25, Outer Nootka Sound, Tlupana Inlet and Esperanza Inlet targeting both wild and hatchery stocks. Gillnet fishing occurred on September 30th, October 7th, October 14th and 15th. The total catch estimate for gillnets in Area 25 was 14,800 chum salmon.

Tseshaht and Hupacasath Bands harvested 2,200 chum salmon collectively for FSC purposes.

3.5 Escapement

Chum salmon that escape the commercial, First Nations, recreational and test fisheries form the gross escapement of spawning chum salmon. This gross escapement is made up of chum salmon that spawn in wild areas, those which are spawned in enhancement facilities, and those which are surplus to facility requirements and are removed from the spawning areas. Gross escapement estimates are used in reconstruction of the total run size in a given year.

Some river systems support summer chum salmon populations. These are relatively minor stocks and because of their distinctively early run timing in Johnstone Strait (*i.e.* July to late August), they are not included in the escapement total for the fall chum salmon run.

The primary enhanced escapement areas are presently limited to the mid Vancouver Island, Squamish River, Burrard Inlet and Fraser River areas. The enhancement facilities in the mid Vancouver Island consist of Big Qualicum, Little Qualicum and Puntledge rivers. There is one enhancement facility in the Burrard Inlet (Capilano River Hatchery: limited chum salmon hatchery enhancement), and the Squamish watershed (Tenderfoot Creek Hatchery) and five in the Fraser River watershed (Inch Creek Hatchery, Chilliwack, Chehalis, and Weaver). The principal use of chum salmon returning to hatcheries in the Lower Fraser and Squamish watersheds is for First Nations Excess Salmon Spawning Requirements (ESSR) fisheries. Enhancement on the Capilano is opportunistic only using chum salmon that return to the hatchery directly for broodstock.

The stocks which are managed within the context of the inside chum salmon plan are the fall run chum salmon. These chum salmon enter Johnstone Strait during the September to November time period. Escapement estimates, for inside chum salmon since 1999, are presented in Table 6.

Table 6. Inside chum salmon spawning escapement estimates for wild and enhanced groupings (Fraser and Non-Fraser) for 1999–2008*.

Grouping	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Fraser (Wild + Enhanced)	2,891,985	667,730	3,018,902	2,243,216	1,451,961	2,633,549	1,264,071	1,875,939	1,026,701	952,602
Non-Fraser (Wild + Enhanced)	519,452	304,593	1,094,002	1,244,457	760,661	980,613	541,105	763,866	633,275	601,443
Total	3,411,437	972,323	4,112,904	3,487,673	2,212,622	3,614,162	1,805,176	2,639,805	1,659,976	1,554,045

*Does not include chum salmon which are surplus to facility requirements and are removed from the spawning areas as they do not contribute to production in subsequent years. Those chum salmon are identified as rack and assigned as catch.

The West Coast of Vancouver Island overall escapements were low. Nitinat spawning escapements were estimated at 50,000, which is the 3rd lowest since 1999. Other estimates of escapements on the WCVI were consistent with the low Nitinat returns.

4. UNITED STATES STOCKS AND FISHERIES

4.1 Washington Run Sizes, Catches, and Spawning Escapements

Tables 7 through 9 provide the pre-season forecasts of run size, post-season estimates of spawning escapement and the total run size for the various chum salmon runs returning to Puget Sound and Coastal Washington areas. The tables provide estimates for three major groupings which are defined by their return timings (summer, fall, and winter chum salmon). Table 10 provides chum salmon catch information from the Strait of Juan de Fuca (SJF) fisheries—Areas 4B, 5, and 6C and the San Juan Islands/Point Roberts (SJI/PR) fisheries—Areas 7 and 7A (Appendix 2). The table also includes annual chum salmon harvest totals for the Puget Sound and the Washington Coastal areas.

Paragraph 10 of the Chum Annex requires that Canada and the United States assess catch levels of summer chum salmon caught during the August 1st through September 15th time-period in boundary area fisheries. Table 11 provides chum salmon catch during the summer chum salmon management period for U.S. boundary area fisheries.

Table 7. Washington summer chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1999–2008). (Source: V. Tribble, WDFW, Nov 2009).

Region	Type	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Strait of Juan de Fuca	Pre-Season	869	792	941	1,468	3,131	4,739	6,803	8,238	8,566	5,969
	Post-Season	577	987	3,982	6,981	7,016	9,360	9,734	8,281	3,320	3,561
	Escapement	573	983	3,955	6,955	6,959	9,341	9,682	8,246	3,295	3,521
Hood Canal	Pre-Season	6,742	6,988	6,871	7,846	10,128	18,078	18,060	19,780	23,729	20,159
	Post-Season	4,527	9,506	13,375	13,170	36,024	95,077	16,165	29,395	12,788	17,570
	Escapement	4,114	8,649	12,044	11,454	35,696	69,995	15,757	26,753	10,781	15,403
South Puget Sound[1]	Pre-Season	121,039	84,867	75,599	155,000	47,788	99,317	38,334	55,300	39,840	64,229
	Post-Season	23,545	39,028	84,111	58,545	49,817	178,199	44,993	78,797	57,786	32,065
	Escapement	23,461	27,705	62,821	46,798	45,945	120,782	24,701	63,345	52,661	20,855

[1]South Puget Sound estimates include only commercial catch and escapement within Puget Sound.

Table 8. Washington fall chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1999–2008). (Source: B. McClellan, WDFW, February 2010, for Willapa Bay and Grays Harbor; V. Tribble, WDFW, November 2009 for other areas).

Region	Type	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Willapa Bay	Pre-Season	78,010	69,188	53,958	79,892	75,817	79,183	63,441	38,754	23,798	40,022
	Post-Season	26,457	46,940	53,545	92,520	84,772	114,756	28,132	23,140	17,542	12,802
	Escapement	25,085	40,281	29,970	60,093	47,797	84,926	11,983	14,907	17,256	9,331
Grays Harbor	Pre-Season	46,400	32,000	20,238	35,773	66,312	45,352	38,038	29,370	12,000	9,903
	Post-Season	15,315	10,780	27,238	66,317	49,784	34,274	20,596	15,786	12,167	8,879
	Escapement	12,377	8,936	26,193	57,526	38,813	17,494	13,483	11,268	11,342	6,249
Strait of Juan de Fuca	Pre-Season	3,029	2,823	1,841	1,761	2,494	2,438	3,460	3,830	2,143	2,745
	Post-Season	1,313	269	1,737	4,890	1,177	3,232	2,382	1,567	769	841
	Escapement	1,272	219	1,562	4,603	1,071	2,739	2,034	1,313	503	454
Nooksack / Samish	Pre-Season	25,378	95,598	82,431	171,000	81,921	78,484	126,869	135,100	19,414	130,070
	Post-Season	94,540	18,866	133,200	109,614	133,654	89,894	67,657	66,602	48,631	27,471
	Escapement	34,594	5,244	75,919	86,284	112,683	53,563	44,512	29,289	21,571	16,257
Skagit	Pre-Season	59,345	168,000	45,875	304,049	52,410	109,715	25,695	164,094	90,481	132,036
	Post-Season	49,562	41,570	97,045	406,476	37,210	171,187	53,652	213,468	37,627	29,946
	Escapement	36,767	22,377	73,175	210,028	18,017	150,196	34,600	105,239	19,576	22,067
Stillaguamish / Snohomish	Pre-Season	151,012	184,867	113,600	685,100	245,246	264,542	225,113	445,800	287,993	229,251
	Post-Season	125,128	55,252	361,843	691,205	214,569	382,831	84,791	479,890	235,799	125,064
	Escapement	91,091	39,050	85,119	377,481	172,354	212,463	38,787	272,925	43,664	38,553
South Puget Sound	Pre-Season	662,000	402,000	363,090	241,500	448,365	470,048	655,742	466,700	408,040	686,511
	Post-Season	236,867	247,776	972,934	970,199	742,798	1,022,643	414,939	939,454	1,036,773	464,193
	Escapement	163,403	105,857	313,570	320,817	316,816	356,712	137,442	369,035	368,849	152,549
Hood Canal	Pre-Season	1,158571	624,623	353,949	446,616	342,061	501,100	749,593	668,400	587,155	668,397
	Post-Season	151,901	153,474	802,605	998,726	1,275,139	1,192,852	356,281	774,893	677,761	553,122
	Escapement	87,096	63,170	257,770	368,854	331,378	229,893	100,242	185,875	162,425	71,925

Table 9. Washington winter chum salmon pre-season and post-season estimates of abundance and estimated spawning escapements (1999–2008) (Source: V. Tribble, WDFW, November 2009).

Region	Type	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
South Puget Sound	Pre-Season	51,973	33,568	54,631	11,700	34,575	76,464	142,406	149,200	81,065	98,922
	Post-Season	19,183	14,532	163,610	237,635	53,112	134,002	72,730	75,833	105,933	89,271
	Escapement	16,319	8,726	139,046	206,469	49,050	98,580	43,908	58,786	73,442	45,162

Table 10. Catch of summer, fall, and winter chum salmon in SJF, SJI/PR, Puget Sound and Washington coastal areas (1999–2008).

Region	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
SJF	7,190	5,621	10,209	1,554	734	5,994	11,560	4,461	6,632	6,084
SJI/PR	79	433	3,247	111,976	81,613	166,170	77,536	105,838	27,384	75,404
Puget Sound[1]	236,235	280,506	1,457,426	1,837,633	1,469,146	1,936,236	645,420	1,536,071	1,239,983	947,758
WA Coast[2]	12,552	23,333	26,383	41,642	49,738	47,500	23,866	13,530	2,711	5,554
Total	256,056	309,893	1,497,265	1,992,805	1,601,250	2,155,900	758,382	1,659,900	1,276,710	1,034,884

[1]All other Puget Sound freshwater and marine catch reporting areas except Strait of Juan de Fuca or San Juan Islands Fisheries.
[2]Coastal Areas combine Catch and Reporting Areas 1–4 including Grays Harbor, Willapa Bay, and Columbia River.

Table 11. Catch of chum salmon in the Strait of Juan de Fuca and the San Juan Islands' commercial fisheries during the summer chum salmon accounting period (1999–2008).

Periods:	7/1–8/11[1]	8/12–8/18	8/19–8/25	8/26–9/1	9/2–9/8	9/9–9/15
95–97 GSI[2]	0.68	0.68	0.397	0.45	0.14	0.07
1999	7	0	0	0	0	0
2000	11	2	0	0	0	0
2001	29	0	0	0	0	0
2002	44	0	0	0	0	0
2003	219	110	70	0	0	15
2004	149	15	0	15	31	25
2005	11	18	17	17	3	34
2006	38	61	51	10	28	3
2007	0	0	0	0	0	9
2008	242	0	1	0	0	5

[1]Indicates cumulative catch through this period.
[2]Proportion of Hood Canal/Strait of Juan de Fuca summer chum salmon from GSI samples from 1995–1997.

4.2 United States Strait of Juan de Fuca Fisheries (Areas 4B, 5, 6C)

4.2.1 Management Intent

During the 2008 season the management strategy for the Strait of Juan de Fuca fishery has consisted of limiting the total effort in this fishery and keying management decisions on the needs of Puget Sound stocks of chum salmon. The regime of this fishery has been maintained by limiting access to four Treaty Indian tribes using only gillnet gear.

This fishery has been constrained by low catch rates, low market prices, and inclement weather conditions, resulting in relatively modest catch levels, which have had a decreasing trend over the period of 1999–2008 (Table 10). The catch in 2008 decreased slightly from the 2007 level, and catch and effort were still below historical levels.

4.2.2 Fishery Description

As in previous years, the chum salmon fishery in Areas 4B, 5 and 6C was restricted to Treaty Indian fishers using gill nets. The fall chum salmon fishery opened the week of October 5, with

a schedule of five days per week. At the end of the first week, the fishery schedule expanded to seven days per week in order to provide further opportunity to the few participants and concluded on November 8.

Incidental catches of chum salmon, prior to the chum salmon directed fishing season, were very limited in 2008, mostly because of the limited effort and open periods, during the passage of summer chum salmon and the early portion of the fall run which overlaps the coho salmon season. Only 248 summer chum salmon, including those caught in test fisheries, were recorded through September 15. During the subsequent fishery, directed at coho salmon, an additional 363 chum salmon were caught. During the fall chum salmon fishery, 5,449 chum salmon were harvested from October 5, to the end of the season, resulting in an annual catch total, for this fishery, of 6,060 (Tables 10 and 11).

4.3 San Juan Islands / Point Roberts Fisheries (Areas 7 and 7A)

4.3.1 Management Intent

Chum salmon fisheries in Areas 7 and 7A were regulated in compliance with the provisions of Chapter 6 of Annex IV of the Pacific Salmon Treaty. More specifically, this chapter calls for a flat exploitation rate limit on chum salmon fisheries in Johnstone Strait, and specifies a fixed harvest ceiling in U.S. Areas 7 and 7A, unless a critically low level of abundance is identified for the runs returning through Johnstone Strait. The base harvest ceiling for the Areas 7 and 7A fishery, in 2008 was 130,000 chum salmon plus 46,000 chum salmon from an accumulated historical difference, plus 15,000 chum salmon from a 2007 shortfall, below the base catch level, for a total target catch of 191,000 chum salmon (Table 12).

While no specific estimates of inside chum salmon abundance were available, Canada indicated in-season, on the basis of Inside area test catches and fisheries, that the Inside area run size was not at a critical level. Chapter 6 of the Annex also specifies that chum salmon fisheries in Areas 7 and 7A may not be initiated prior to October 10 and that, if the Fraser River chum salmon run is updated in-season to levels lower than 900,000 fish, the U.S. would take actions to limit fishery impacts on Fraser chum. The initial in-season Fraser chum salmon run size estimate exceeded 2 million, so this provision was not applicable to the 2008 management actions.

Table 12. Summary of U.S. Areas 7 and 7A limits and catches in 2008. The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S.

Year	PSC Guidance Specified Limit	Adjusted Limit[1,2]	Actual Catch	Annual Overage or Shortfall	Accumulated Balance Remaining	Total Accumulated Balance Plus Shortfall Due
2003			81,613	0	228,300[1]	228,300
2004	130,000	176,000[1]	166,170	0	182,300	182,300
2005	130,000	176,000[1]	77,536	15,000[2]	136,300	151,300
2006	130,000	191,000[1,2]	105,838	15,000[2]	90,300	105,300
2007	130,000	191,000[1,2]	27,384	15,000[2]	44,300	59,300
2008	130,000	191,000[1,2]	75,404	15,000[2]	0	0

[1]The adjusted catch limit includes a portion (46,000) of the amount that was due to the U.S. That amount is subtracted from the total accumulated difference, whether actually harvested or not.

[2]This value is identified in the amended Chum Annex (Appendix 1).

Paragraph 3 of the Chum Annex also provides for the U.S. to manage its fishery to maintain a traditional proportion of the catch between Areas 7 and 7A and to avoid concentrations of effort along the international boundary in Area 7A. There have been only five years with a significant fishery during this time-period and the percentage of the catch in Area 7A ranged from 26.6 % to 53.4% (Table 13). Historically, the catch had been distributed approximately 50/50 between the two areas.

Table 13. Distribution of catch between areas 7 and 7A (1999–2008).

Catch Area	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
7	0	430	2,241	69,475	39,990	77,412	56,904	64,907	17,315	51,142
7A	79	2	1,006	42,501	41,642	88,758	20,632	40,931	10,069	24,262
% in 7A	*	*	*	38.0%	51.0%	53.4%	26.6%	38.7%	36.8%	32.1%

*Non-fishing years; primarily incidental catches.

4.3.2 Fishery Description

Preseason forecasts for chum salmon returns to Puget Sound were for a moderate fall chum salmon run totaling approximately 1.85 million fish. In-season estimates indicated that the returns to Hood Canal and Stillaguamish - Snohomish were approximately as forecasted and those to Skagit and South Puget Sound below forecast. However, post-season numbers showed that Puget Sound fall chum salmon returned overall at only 65% of the forecasted levels, with Nooksack/Samish, Skagit, and Strait of Juan de Fuca stocks at 21%, 23%, and 31%, respectively, of their forecasted numbers.

Non-Treaty reef net fisheries targeting marked coho salmon were conducted from the end of Fraser Panel control until October 9 and remained open, targeting chum salmon from October 10 through November 15. The chum salmon harvest during this period was 38 fish.

The Treaty Indian gillnet and purse seine fishery opened after the start of the fall chum salmon management period, on October 11, and remained open until November 15. The Non-Treaty fleet opened for one day of combined gillnet and purse seine fishing on October 10.

For the week beginning October 12, the Non-Treaty fishery opened for combined gillnet and purse seine fishing on October 15 and remained open until November 15.

Catches per vessel were low in the first weeks of the fishery, dropping off quickly in the latter part of the period. Effort remained relatively low throughout the fishery primarily because of the availability of alternate fishing opportunities in other Puget Sound areas, as well as because of intervening periods of inclement weather. In the last three weeks of the fishery, there was very little catch and effort. This fishery did not reach its base catch ceiling in 2008.

There were no summer chum salmon caught in Areas 7 and 7A prior to September 16. The total chum salmon catch by all gears in Areas 6, 7, and 7A, through November 15, was 75,626. Catch distribution, between Areas 7 and 7A, was 67.8% and 32.1% respectively.

During the fall chum salmon fisheries in Areas 7 and 7A, there was a bycatch of 162 coho salmon and one steelhead. The steelhead bycatch during the chum salmon fishery in Areas 4B, 5, 6C was 234 coho salmon and 12 steelhead.

Chum and coho salmon tissue samples were collected for genetic analysis from this fishery in 2008 (Section 5.3).

5. STOCK IDENTIFICATION

5.1 Tagging of Adult Chum Salmon

No adult tagging projects were reported by either United States or Canada in marine or near shore areas in 2008.

5.2 Coded Wire Tagging, Otolith and Fin Marking

United States

A summer chum salmon supplementation program was started in 1992 at the Quilcene National Fish Hatchery to address severe declines in the numbers of summer chum salmon returning to the Quilcene River and Hood Canal. In recent years, an adipose-only clip was utilized to aid in identifying hatchery fish for terminal fisheries management and project evaluation purposes. Brood year 2003 was the final year summer chum salmon were marked and released from the hatchery.

A number of other hatchery supplementation and reintroduction programs for summer chum salmon in the Hood Canal and Strait of Juan de Fuca regions, and fall chum salmon in the Lower Columbia have utilized otolith marks to aid in assessing the success of the programs and to determine the proportion of hatchery and natural origin fish on the spawning grounds (Table 14). Supplementation summer chum salmon releases for recovery ended at Discovery, Chimacum, and Union with brood year 2003.

Table 14. Numbers of summer and fall chum salmon released with otolith marks, by brood year and location (2002–2008) (Source: J. Grimm, WDFW April 2010).

Brood Year	Puget Sound Summer Chum							
	Sequim	Discovery Bay[1]	Chimacum[1]	Big Beef	Hamma Hamma	Lilliwaup	Union[1]	Tahuya
2002	20,887	118,347	57,300	72,622	61,000	96,000	82,636	
2003	49,897	88,610	57,435	76,353	75,356	103,913	35,343	111,232
2004	76,982			14,814	57,000	99,500		118,872
2005	57,300			5,685	117,837	106,466		119,260
2006	79,428				303,100	177,600		133,826
2007	73,840				48,530			53,632
2008	101,443				228,007	86,114		136,332
	Puget Sound Fall Chum							
	Whatcom Creek							
2007	450,000							
2008	400,000							
	Lower Columbia River Fall Chum							
	Grays River Hatchery		Sea Res Hatchery			Washougal Hatchery		
2002	398,000		84,818			218,283		
2003	357,000		102,132			75,952		
2004	163,000		0			0		
2005	155,501		0			19,578		
2006	129,427							
2007	77,609							
2008	104,651							

[1]Program discontinued after brood year 2003.

Canada

Thermal marking of otoliths has been used as a technique of mass marking hatchery raised salmonids in B.C. since 1992. The method involves manipulating the temperature of the rearing water by at least 2°C to induce a mark on the otolith. The change in water temperature can be accomplished through the use of two different water sources, through heating the water or by chilling it. By altering water temperatures over a period of time a unique mark can be created. Thermal marking was first used on chum salmon from Nitinat hatchery in 1993 and continues to be used as a means of estimating hatchery contribution to both fisheries and escapement (Table 15). Thermal marking is currently the only method of marking being applied to chum salmon from Nitinat hatchery (due to the dropping of the Multiple Fin Clip program). Transplanting thermally marked chum salmon into Klanawa River started with the 2001 brood and ended with 2006 brood year.

Conuma Hatchery first began thermal marking several stocks with the 1998 brood year. A comprehensive sampling program occurred during the fall chum salmon fisheries and permitted a better understanding of timing and distribution of the different stocks in Nootka Sound.

Enhanced contributions of chum salmon from major hatchery facilities are based on marking a portion of the fry released with an adipose clip and coded-wire tag (Ad-cwt) or a ventral finclip with or without an adipose clip, and subsequent recovery of these marks in the commercial fishery and escapement programs. Released chum salmon marked with finclips include the Big

Qualicum River (since 1964) and Little Qualicum River (1979–2002). Since egg and fry mortality generally is less than 10%, fry enumeration is considered very accurate. Not all release groups are represented by a mark. Contributions for those groups are estimated by associating them with a marked release group with a similar size and release timing. Tables 16 and 17 provide a summary of marks applied from 1999–2008 brood years.

Table 15. Releases of thermally marked chum salmon from WCVI based Canadian hatchery facilities, 1999–2008.

Brood Year	Hatchery Facility							
	Nitinat Release Sites		Conuma Release Sites					
	Nitinat River & Lake	Klanawa River	Conuma River	Conuma Estuary	Tlupana River	Sucowa River	Canton River	Deserted River
1999	23,721,507	-	525,964	1,369,785	1,103,714	1,883,722	1,071,147	1,822,476
2000	5,153,902	-	543,511	1,296,654	998,400	139,090	1,009,746	269,284
2001	27,093,836	3,162,846	569,118	1,649,290	390,754	200,803	1,070,539	272,395
2002	22,757,842	2,915,502	0	1,792,758	1,038,542	445,007	892,140	341,635
2003	21,252,421	2,516,338	0	1,585,534	425,261	410,872	484,570	798,330
2004	32,684,608	2,631,539	0	1,882,230	932,556	1,023,658	679,554	0
2005	36,724,205	2,739,742	0	914,381	744,834	256,296	434,449	0
2006	26,323,943	2,585,428	0	1,455,119	1,139,028	181,333	133,731	0
2007	13,004,189	0	0	271,820	109,922	15,701	47,846	0
2008	7,631,058	0	0	1,011,562	254,905	292,430	418,655	0

Table 16. Releases of CWT (coded-wire tag) chum salmon (and the associated unclipped releases) from southern BC based Canadian hatchery facilities, 1999–2008.

Brood Year	Hatchery Release Sites							
	Inch Creek				Sliammon River			
	CWT + Adipose clip	Adipose clip only	Unclipped	Total	CWT + Adipose clip	Adipose clip only	Unclipped	Total
1999	49,826	98	952,769	1,002,693	100,053	0	505,633	605,686
2000	49,759	264	926,658	976,681	99,615	879	500,628	601,122
2001	49,931	100	1,124,599	1,174,630	-	-	-	-

Table 17. Releases of marked chum salmon (Clip Type-AD: adipose; LV: left ventral; RV: right ventral; AN: anal; D: dorsal) from southern BC based Canadian hatchery facilities, 1999–2008.

Stock	Brood Year	Clip Type	# Clipped	# Poor Clips / Unclipped	Total
Big Qualicum River	1999	ADRV	250,225	5,014	255,239
	2001	ADRV	245,794	8,596	254,390
	2002	ADRV	252,260	10,359	262,619
	2003	ADRV	251,939	4,856	256,795
	2004	ADRV	261,366	6,579	267,945
	2005	ADRV	252,585	9,775	262,360
	2006	ADRV	252,016	6,853	258,869
	2007	ADRV	251,329	9,471	260,800
	2008	ADRV	204,801	5,409	210,210
Comma River	1999	ADLV	99,225	8,549	107,774
	2000	ADLV	97,906	4,720	102,626
	2001	ADLV	102,059	4,018	106,077
Deserted/NWVI	1999	RV	75,043	4,560	79,603
	2000	RV	76,928	1,174	78,102
Little Qualicum River	1999	ADLV	251,600	4,129	255,729
	2001	ADLV	266,330	7,874	274,204
	2002	ADLV	249,887	120	250,007
Salloomt River	2001	LV	97,015	4,595	101,610
	2002	LV	100,637	4,742	105,379
	2003	LV	103,148	1,054	104,202
Theodosia River	2002	LV	101,029	0	101,029
Sucwoa River	1999	LV	76,297	715	77,012
	2000	LV	76,400	0	76,400
	2001	LV	76,516	0	76,516
Sugsaw Creek	2000	LV	13,000	0	13,000
	2001	LV	31,000	0	31,000
	2002	LV	11,000	0	11,000
	2003	LV	11,000	0	11,000
	2004	LV	20,600	0	20,600

5.3 Genetic Stock Identification

In 2008, the Committee began to develop a joint recommendation to the Southern Panel concerning the type of stock identification methodology to be used for immediate and future application of Canada and United States (U.S.) chum salmon stock assessment. Under the Pacific Salmon Treaty (Annex IV, Chapter 6, Section 2):

> *"When the Parties provide stock composition information for fisheries, the Committee shall evaluate and report its conclusions using bilaterally agreed upon methods."*

Fisheries of interest include Canadian fisheries (Johnstone Strait, Qualicum, Fraser River, and Nitinat) and U.S. fisheries (Point Roberts, San Juan Islands and the Strait of Juan de Fuca).

5.3.1 Fishery Sample Collection for DNA Stock Identification.

United States

In a joint study of CDFO (P. Van Will and T. Beacham) and NWIFC (G. Kirby), mixed stock fishery estimates were made in U.S. fisheries Areas 7 and 7A (Kirby 2008, 2009). During 2008, October 10th–November 8th, 2008 DNA tissues were collected from 1,362 chum salmon collected in the Areas 7 (711) and 7A (651) commercial fishery. Additionally, through another project, 600 DNA tissue samples were collected near Apple Cove Point in Puget Sound Area 9, 200 each on October 30th, November 5th, and November 13th as the fourth year of chum salmon DNA collection from this test fishery.

Stock composition estimates to 9 regional aggregate groupings were made for Area 7 and Area 7A for Management Weeks 41, 42, 43, and 42 through 44, respectively. A 14-locus microsatellite (mSAT) baseline consisting of 62 Canadian and 18 U.S. populations was used for the mixture analysis. Funding was provided by PSC Southern Boundary Restoration and Enhancement Fund for 2 years (Kirby 2008, 2009).

In 2008, WDFW used genetic techniques to clarify otolith marking data in the monitoring of Hood Canal summer chum salmon supplementation projects. All returning supplementation origin summer chum salmon were otolith marked, but there was ambiguity between marks for some programs, meaning that fish could be identified as supplementation or natural origin, but some supplementation fish could not be identified to their program of origin. Where possible, analysis of DNA samples from fish with ambiguous marks was used to identify fish to the program of origin.

During 2008, chum salmon DNA samples were collected for stock identification purposes during the chum directed commercial fisheries occurring Areas 7 and 7A.

Among focused studies, WDFW continued its use of GSI techniques in the discrimination of supplementation origin returning adult summer chum salmon in Hood Canal. In particular, mSAT DNA data were used to clarify the uncertain hatchery assignments generated from otolith thermal marks. WDFW also conducted a juvenile stock assignment study in the Strait of Juan de Fuca and Hood Canal during 2008. This study focused mainly on documenting the emigration timing and relative production patterns of summer and fall chum salmon in key populations.

The Tulalip Tribes continued sampling aimed at assessing the persistence of genetically marked fall chum salmon phenotypes in the Tulalip Hatchery chum salmon population and contribution of Tulalip Hatchery fish to local fisheries and escapement. Genetic marking efforts (i.e., selective breeding that altered allele frequencies for *mIDHP-1* and *mMEP-2* allozyme loci) were initiated at the hatchery in the early 1990s to help quantify its contribution to regional fry production, catch, and spawning escapement in neighboring streams (K. Rawson, Tulalip Tribes 2005, personal communication). Fishery and hatchery escapement tissue samples were collected

during 2008 and are being stored for processing at a future date at the Tulalip Stock Assessment Laboratory.

Canada

GSI samples were collected during the Johnstone Straits purse seine fisheries in 2008. A summary of historic chum salmon GSI sampling is presented in Table 18.

Table 18. Number of chum salmon sampled for GSI data, 1999–2008.

Year	Commercial Samples			Test Fishery Samples		
	Johnstone Strait	Qualicum	Nitinat	Johnstone Strait	Qualicum	Nitinat
1999	0	0	0	0	0	0
2000	300	0	0	0	0	0
2001	300	0	0	0	0	0
2002	0	0	0	0	0	0
2003	600	0	0	100	0	0
2004	600	0	0	0	0	0
2005	0	0	0	0	0	0
2006	720	0	0	0	0	0
2007	858	0	0	0	0	0
2008	865	0	0	0	0	0

5.3.2 Baseline Collection for DNA Stock Identification.

United States

During 2008, WDFW continued its baseline sampling of relevant Washington State populations of chum salmon (Table 19). In total, 1,004 fin tissues were collected from 14 locations. While more than half of these samples were from Hood Canal, several Strait of Juan de Fuca and lower Columbia River locations were also sampled. Fin tissues were clipped and stored for future analyses of DNA-based genetic variation.

Table 19. Chum salmon genetics tissue collections from Washington in 2008 (Source: T. Kassler, WDFW, 2009).

Code	Collection Name / Locality	Origin	N
08HB	Dewatto River	mixed	2
08GR	Chimacum Creek	mixed	15
08GZ	Tahuya River	mixed	21
08GP	Salmon Creek	mixed	23
08GQ	Snow Creek	mixed	23
08HU	Lilliwaup River-Broodstock	unknown	68
08GO	Jimmycomelately Creek	mixed	86
08GW	Lilliwaup River	mixed	86
08KJ	Grays River Hatchery	hatchery	88
08GT	Dosewallips River	mixed	108
08GV	Hamma Hamma River	mixed	110
08GY	Union River	mixed	116
08GU	Duckabush River	mixed	119
08HT	Hamma Hamma River-Broodstock	unknown	139
		TOTAL	1004

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Kirby, G. 2009. Southern Study Area Chum Stock Distribution Assessment in Washington San Juan Islands–Pt. Roberts and in British Columbia Southern Gulf Fisheries. Unpublished Technical Report, June 2009, NWIFC, Olympia, WA. Final Report to Pacific Salmon Commission Southern Boundary Restoration and Enhancement Fund.

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APPENDIX 1

ANNEX IV, CHAPTER 6, OF THE PACIFIC SALMON TREATY [2006–2008]

Southern British Columbia and Washington State Chum Salmon

The provisions of this Chapter shall apply for the period 2006 through 2008.

1. The Parties shall maintain a Joint Chum Technical Committee ("the Committee") reporting, unless otherwise agreed, to the Southern Panel and the Commission. The Committee will undertake to, *inter alia*:

   (a) identify and review the status of stocks of primary concern;

   (b) present the most current information on harvest rates and patterns on these stocks, and develop a joint data base for assessments;

   (c) collate available information on the productivity of chum stocks to identify escapements which produce maximum sustainable harvests and allowable harvest rates;

   (d) present historical catch data, associated fishing regimes, and information on stock composition in fisheries harvesting those stocks;

   (e) devise analytical methods for the development of alternative regulatory and production strategies;

   (f) identify information and research needs, to include future monitoring programs for stock assessment; and,

   (g) for each season, make stock and fishery assessments and evaluate the effectiveness of management.

2. The catch composition of fisheries covered by this chapter will be estimated by post-season analysis using methods agreed upon by the Committee.

3. Canada and the United States shall assess catch levels and make attempts to collect additional genetic samples from any chum salmon caught during the July 1 through September 15 time period in the boundary area fisheries (U.S. Areas 4B, 5, 6C, 7 and 7A; Canadian Areas 18, 19, 20, 21, and 29).

4. During the period from July 1 through September 15, Canada will require the live release of chum salmon from all purse seine gear fishing in the Strait of Juan de Fuca (Canadian Area 20) and the United States will require the same for the non-Indian seine fisheries in Areas 7 and 7A. Note: By U.S. regulation, purse seine fisheries are not permitted in U.S. Areas 4B, 5 and 6C.

5. In the years 2006 through 2008, Canada will manage its Johnstone Strait, Strait of Georgia, and Fraser River chum salmon fisheries to provide continued rebuilding of depressed naturally spawning chum salmon stocks, and, to the extent practicable, not increase interceptions of U.S. origin chum salmon. Terminal fisheries conducted on specific stocks with identified surpluses will be managed to minimize interception of non-targeted stocks.

6. In the years 2006 through 2008, Canada will manage its Johnstone Strait mixed stock fishery as follows:

   a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter as critical. By the end of 2008, Canada will determine a revised critical threshold.

   b) For run sizes above the critical threshold, Canada will conduct fisheries with a combined exploitation rate of up to 20% in Johnstone Strait.

   c) When run sizes are expected to be below the critical threshold, Canada will notify the United States and will only conduct assessment fisheries and non-commercial fisheries. Other commercial fisheries targeting chum salmon will be suspended.

7. In the years 2006 through 2008, Canada will manage its Fraser River fisheries for chum salmon as follows:

   a) For Fraser River terminal area run sizes, identified inseason, at abundance levels lower than 900,000 chum salmon, the Canadian commercial chum salmon fisheries within the Fraser River and in associated marine areas (Area 29), will be suspended.

   b) For Fraser River terminal area run sizes, identified inseason at levels greater than 900,000 chum salmon, Canadian commercial chum salmon fisheries within the Fraser River, shall be guided by the limits of the in-river Total Allowable Catch set by Canada.

8. Canada will manage the Nitinat gillnet and purse seine fisheries for chum salmon to minimize the harvest of non-targeted stocks.

9. For the years 2006 through 2008, Canada shall conduct a genetic sampling program of chum salmon taken in the West Coast Vancouver Island troll fishery if early-season catch information indicates that catch totals for the July 1 through September 15 season may

reach levels similar to 1985 and 1986. Sampling, should it occur, will include catches taken from the southern areas (Canadian Areas 121-124).

10. In the years 2006 through 2008, the United States will manage its chum salmon fishery in Areas 7 and 7A as follows:

    a) In the years 2006 through 2008, chum salmon abundance levels of less than a provisional threshold of 1.1 million will be defined, for purposes of this chapter, as critical. By the end of 2008, Canada will determine a revised critical threshold.

    b) For run sizes above the critical threshold, the base catch ceiling for the U.S. chum salmon fisheries in Areas 7 and 7A will be 130,000 chum salmon.

    c) For run sizes below the critical threshold, the U.S. catch of chum in Areas 7 and 7A shall be limited to chum salmon taken incidentally to other species and in other minor fisheries, but shall not exceed 20,000, provided that catches for the purpose of genetic stock identification sampling shall not be included in the aforementioned limit.

    d) The Fraser River chum salmon abundance estimate will be updated no later than October 22. If the run size is estimated to be less than 900,000, the United States will take immediate action to restrict its fishery impacts on Fraser chum. The Parties will then meet within 3 days of the update to discuss further U.S. fishing opportunities to meet conservation objectives.

    e) U.S. commercial fisheries for fall chum salmon in Areas 7 and 7A will not occur prior to October 10.

    f) The United States will manage the Areas 7 and 7A fisheries for chum salmon with the intent to minimize, to the extent practicable, the harvest of non-targeted species.

11. In the years 2006 through 2008, the United States' annual total harvest ceiling for chum salmon in Areas 7 and 7A, shall be defined as follows:

    a) It is the intent of the parties to eliminate the accumulated historical difference (138,000 total, as of the start of 2006), by 2008. Therefore, in any non-critical year in which a portion of the assigned difference is not taken, that portion shall be foregone.

    b) When the chum salmon run size is below the critical threshold, the base catch ceiling will be 20,000 chum salmon. When the fishery is limited to 20,000 chum salmon, the portion of the accumulated historical difference will not be added to the catch ceiling and the remaining accumulated historical difference will be recalculated and applied to subsequent years, up to and including 2008.

c) When the chum salmon run size is above the critical threshold, the base catch ceiling will be 130,000 chum salmon, plus 46,000 chum salmon of the accumulated historical difference, plus any shortfall of up to a maximum of 15,000 chum salmon generated from a failure to capture the preceding non-critical year's base catch ceiling, minus any amortized overage adjustment caused by a prior year's overage of that year's total harvest ceiling.

d) It is also the intent of the Parties to avoid future accumulations. Therefore any annual shortfall below the base catch ceiling of 130,000 chum salmon shall be limited to a maximum of 15,000 chum salmon and shall be added to the next available non-critical season's base ceiling. If it is not taken in that fishery, it shall be foregone.

e) Adjustments due to past overages shall not be limited, but they may be amortized over subsequent years, up to and including 2008.

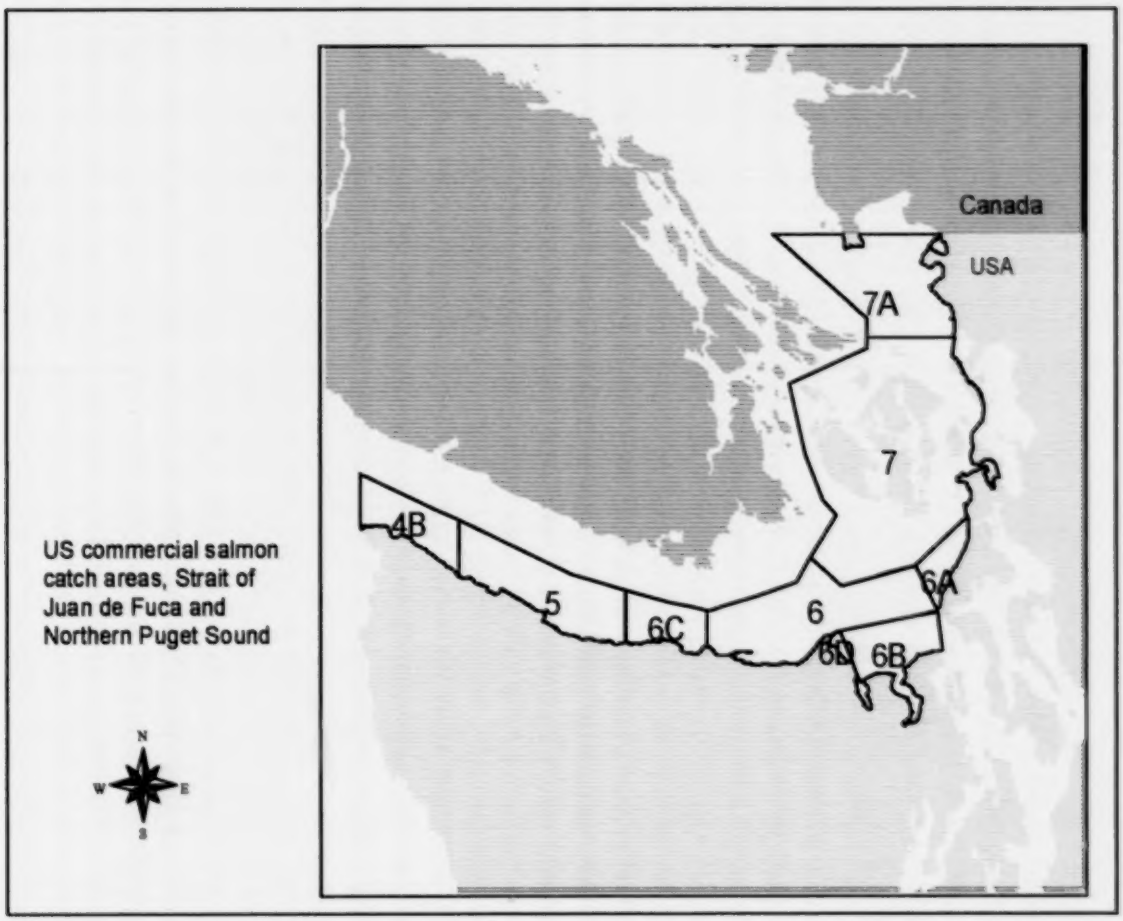
f) When the chum salmon run size is below the critical threshold, no shortfalls may be accrued; however, any overages shall be carried forward as indicated above.

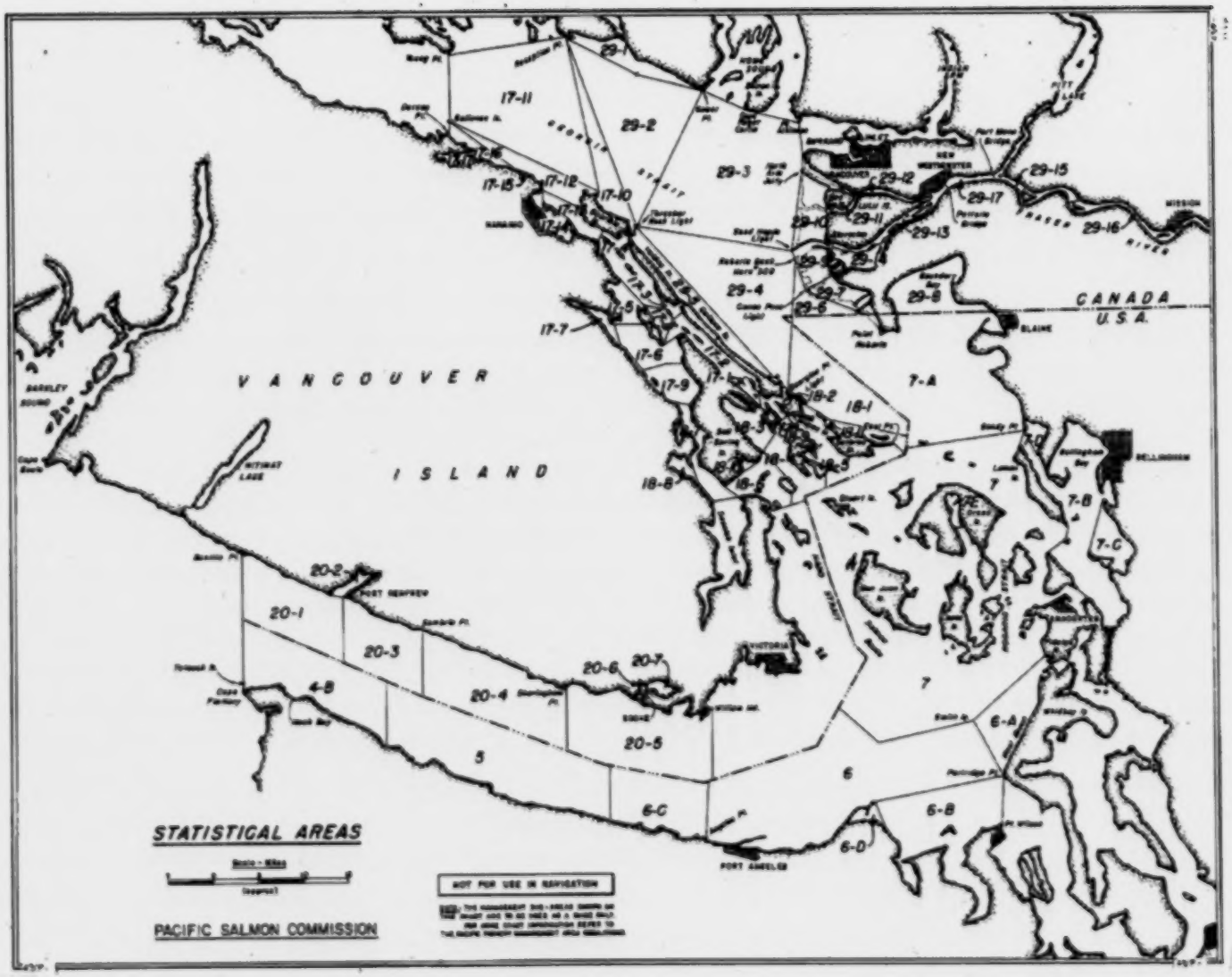
12. In the years 2006 through 2008, the United States shall conduct its chum salmon fishery in the Strait of Juan de Fuca (United States Areas 4B, 5 and 6C) so as to maintain the limited effort nature of this fishery, and, to the extent practicable, not increase interceptions of Canadian origin chum salmon. The United States shall continue to monitor this fishery to determine if recent catch levels indicate an increasing level of interception.

13. All information concerning bycatch of other salmon species from the chum salmon fisheries covered by this chapter will be shared between the Parties in the annual Post Season Report.

APPENDIX 2

UNITED STATES AND CANADIAN STATISTICAL AREA MAPS

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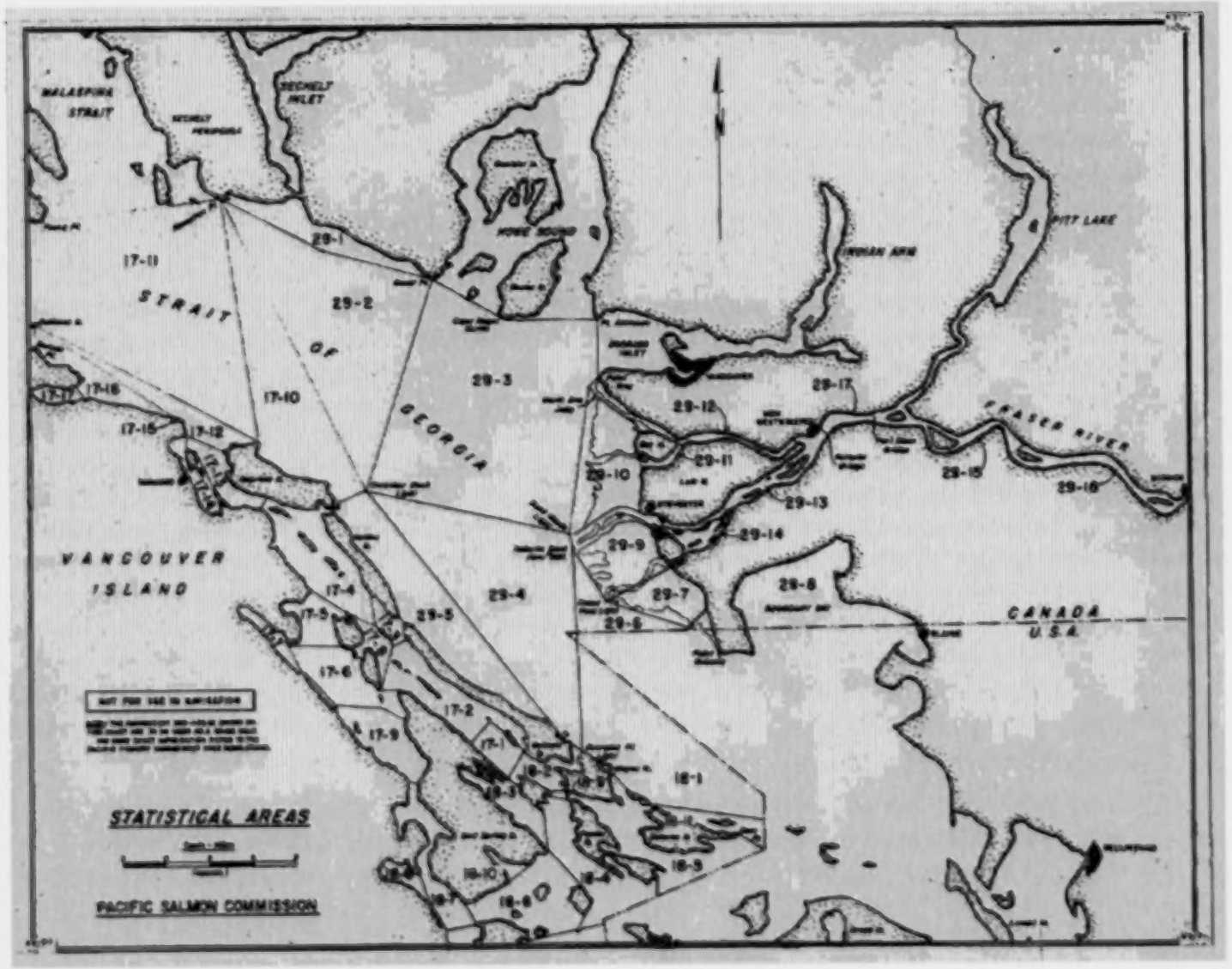
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